

CLAIMS

1. A nucleic acid encoding an Essential For Growth (EFG) polypeptide selected
5 from the group consisting of :

(i) a nucleic acid molecule encoding a polypeptide comprising the amino acid
sequence depicted in one of SEQ ID
N°3,6,9,12,15,18,21,24,27,30,33,36,39,42,45,48,51,54,57,60,94,98,102,106,110,114,
118,122,126,130,134,138,142,146,150,154,158,162,166,170 ;

10 (ii) a nucleic acid molecule comprising the nucleic acid sequence as depicted
in one of SEQ ID
N°1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,92,96,100,104,108,112,
116,120,124,128,132,136,140,144,148,152,156,160,164,168 ;

(iii) a nucleic sequence having at least 80, 85, 90, 95, 98, 99% identity with a
15 sequence of SEQ ID
N°1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,92,96,100,104,108,112,
116,120,124,128,132,136,140,144,148,152,156,160,164,168 ;

(iv) a nucleic acid molecule which hybridizes under stringent conditions to:

(a) a nucleic acid as defined in (i), (ii) and (iii), or

20 (b) a complementary strand of (a) ;

(v) a nucleic acid the sequence of which is degenerate as a result of the
genetic code to the sequence of a nucleic acid as defined in (i), (ii), (iii) and (iv).

2. An isolated nucleic acid, said nucleic acid comprising a nucleotide sequence
25 encoding:

i) a EFG polypeptide comprising an amino acid sequence having at least
80% identity to a sequence of SEQ ID
N°3,6,9,12,15,18,21,24,27,30,33,36,39,42,45,48,51,54,57,60,94,98,10
2,106,110,114,118,122,126,130,134,138,142,146,150,154,158,162,16

- 6,170; or
- ii) a biologically active fragment of said polypeptide.
3. An isolated nucleic acid, said nucleic acid comprising a nucleotide sequence
5 encoding:
- i) a EFG polypeptide comprising an amino acid sequence which is
orthologous to a sequence of SEQ ID
N°3,6,9,12,15,18,21,24,27,30,33,36,39,42,45,48,51,54,57,60,94,98,10
2,106,110,114,118,122,126,130,134,138,142,146,150,154,158,162,16
10 6,170; or
- ii) a biologically active fragment of said polypeptide.
4. A nucleic acid sequence of any of claims 1 to 3 encoding a polypeptide of
A. fumigatus exhibiting a biological function associated to fungal growth, said
15 nucleic acid comprising a sequence of SEQ ID
N°2,5,8,14,17,20,23,26,29,32,35,38,41,44,47,50,53,56,59,93,97,101,105,109,113,11
7,121,125,129,133,137,141,145,149,153,157,161,165,169.
5. A nucleic acid sequence of claim 4, wherein said biological function
20 associated to fungal growth is chosen among: protein synthesis, protein maturation,
protein transport, nuclear architecture, RNA processing, nucleotide metabolism,
chromatine structure, cell cycle control.
6. The nucleic acid of claim 1, wherein said nucleic acid is operably linked to a
25 promoter.
7. An expression cassette comprising the nucleic acid of claim 6.
8. A host cell comprising the expression cassette of claim 7.

9. A biologically active polypeptide encoded by a nucleic acid according to any of claims 1 to 5.

10. A polypeptide according to claim 9 or a biologically active fragment thereof,
5 said polypeptide comprising an amino acid sequence of at least 80% amino acid
sequence identity to a sequence of SEQ ID
N°3,6,9,12,15,18,21,24,27,30,33,36,39,42,45,48,51,54,57,60,94,98,102,106,110,114,
118,122,126,130,134,138,142,146,150,154,158,162,166,170.

10 11. A method of identifying a candidate inhibitor of EFG polypeptide, said
method comprising :

- a) contacting a EFG polypeptide according to claim 9 or 10 with a test compound ;
- b) determining whether said compound selectively binds to said polypeptide, said
binding indicating that said compound is a candidate inhibitor.

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12. A method of identifying a candidate inhibitor of EFG polypeptide, said
method comprising :

- a) contacting said polypeptide with a test compound ;
- b) determining whether said compound selectively inhibits the activity of said
20 polypeptide, said inhibition indicating that said compound is a candidate inhibitor.

13. A method for detecting the presence of a nucleic acid comprising a nucleotide
sequence of SEQ ID
N°1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,92,96,100,104,108,112,
25 116,120,124,128,132,136,140,144,148,152,156,160,164,168, a fragment or a variant
thereof and a complementary sequence thereto in a sample, said method comprising
the following steps of:

- a) bringing into contact a nucleic acid probe or a plurality of nucleic acid
probes which can hybridize with a nucleotide sequence included in a nucleic acid

sequence of SEQ ID
N°1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46,49,52,55,58,92,96,100,104,108,112,
116,120,124,128,132,136,140,144,148,152,156,160,164,168, a fragment or a variant
thereof and a complementary sequence thereto and the sample to be assayed; and

5 b) detecting the hybrid complex formed between the probe and a nucleic acid in
the sample.

14. A method for locating at least one gene essential for the growth of a haploid
fungus, said method comprising the following successive steps :

- 10 - generation of diploid strain from fungal haploid strain ;
- mutagenesis of said diploid strain;
- haploidisation of the diploid transformant strain, in selection conditions such
that the absence of haploid progeny is indicative of mutagenesis occurring in
essential gene;

15 wherein said mutagenesis is an *in vivo* transposon mutagenesis.

15. The method of claim 14, wherein said fungus is of the *Aspergillus* genus, or
the *Penicillium* genus.

20 16. The method of claim 14 or 15, wherein said fungus is *Aspergillus fumigatus*.

17. The method of claim 14, wherein the transposon is carried by the plasmid
pNIpyr.

25 18. The method of claim 14 or 17, wherein the transposon is the *impala160*
transposon or a derivative thereof.

19. The method of claim 14, wherein said diploid strain is chosen from the group
comprising CEA 225, CEA 226, and CEA 227.

20. The method of claim 14, wherein the selection medium is a benomyl-containing medium.
- 5 21. Plasmid pNIpyr (CNCM I-2815).
22. The diploid strain CEA 225 (CNCM I-2816).
23. The diploid strain CEA 226 (CNCM I-2817).
- 10 24. The diploid strain CEA 227 (CNCM I-2818).
25. A method for screening compounds that are active against *A. fumigatus* comprising :
- 15 - preparing an *A. fumigatus* strain that is heterozygous for an EFG gene (heterozygous EFGn/efgn) ;
- preparing an *A. fumigatus* strain that is homozygous for the EFG gene (homozygous EFGn/EFGn) ;
- comparing the effect of a candidate compound on the heterozygous EFGn/efgn and on the homozygous EFGn/EFGn,
- 20 the higher inhibiting effect on the heterozygous EFGn/efgn than on the homozygous EFGn/EFGn indicating that the compound is an inhibitor.
26. An isolated nucleic acid sequence according to any of claims 1 to 5,
- 25 obtainable by a method according to claim 14.
27. A composition capable of inhibiting haploid fungal growth, wherein said composition comprises at least one compound capable of inhibiting the expression of at least one EFG gene as defined in any of claims 1 to 5.

28. The composition of claim 27, which is a pharmaceutical composition.
29. The composition of claim 27 or 28, which is a fungicidal composition.